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EXPLORATION OF LUNAR SURFACE HABITATS FOR SUSTAINED CREWED MISSIONS

Abstract

The exploration of lunar surface habitats for sustained crewed missions lasting 30 days or longer is crucial for advancing human presence beyond Earth. These missions could be of varying kinds; including Lunar surface exploration, scientific research, tourism, and outer space observation. To support these missions, habitats on the lunar surface must be carefully designed to provide a safe and habitable environment for the crew. These habitats would be made up of inflatable materials. These materials offer advantages such as lightweight construction and ease of deployment, making them ideal for lunar habitats. The external and internal dimensions of these habitats depend on factors such as the type of mission, the number of crew members, and the duration of the stay. Designing these habitats requires careful consideration of various factors, including radiation protection, thermal regulation, life support systems, and structural integrity. In this work, an optimization scheme has been presented to select the most appropriate lunar habitat design based on the specific requirements of the mission. This scheme considers the trade-offs between these factors to identify the optimal design that meets the mission requirements. By designing and optimizing lunar surface habitats, we can ensure the success of sustained crewed missions on the lunar surface.